

Quality Assurance in Statistics Without Borders -- Statisticians Doing Good!

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Abstract

This paper discusses the development, role, and issues in the application of quality assurance (which we call Delivery and Quality Assurance, or DQA) in Statistics Without Borders (SWB), a pro-bono statistical consulting organization that is an Outreach Group of the ASA. DQA is an essential part of SWB, which functions as a professional organization but run by unpaid volunteers. Problems can easily develop in a consulting project, and we need to be on top of them as soon as possible. SWB has multiple layers of oversight, including expert consultants who approve the technical aspects of the project, and DQA analysts who ensure that project teams do what they committed to and that all the i's are dotted and the t's crossed. I am the vice chair for the DQA team, and I keep an eye on our volunteers -- this paper describes my impressions and experiences.

Key Words: Statistics Without Borders, quality assurance, pro bono,

1. Statistics Without Borders

Yes, there really is such an organization! Most readers of this paper will know about Doctors Without Borders. And Engineers Without Borders. But fewer are familiar with Statistics Without Borders (SWB).

SWB grew out of volunteerism interest in the ASA. In 2005, ASA President Fritz Scheuren helped form a Volunteerism Special Interest Group (SIG), with a focus on human rights. In 2008, SWB was formed as part of that SIG to focus on public health.

SWB grew, while the SIG lost members (and finally disappeared). As of 2010 SWB became a formal "Outreach Group" of the ASA. We now do almost any kind of socially-useful pro bono statistics.

Almost all of our work is remote, by Zoom, Skype, email, and phone. Our commonest task is helping with survey design and analysis, but various other types of projects also arise. We occasionally do disaster relief, such as helping locate resources. We had a team on the ground in Haiti after the earthquake of a few years ago.

SWB does professional-level work although we are not paid for it. Thus, in some ways we need to function like a business. We need a formal agreement with the client, known as a Statement of Work (SOW). We need to have oversight at several levels. Some of that oversight involves content – we have experts for that. Other aspects are delivery and quality assurance (DQA), which is where I come in.

Each team has an expert (we call a “statistical consultant” or SC) assigned to watch the technical details. Since the whole team is statistical, some of us wanted a term like "expert". But people balk at naming themselves an “expert”, so it was felt that that term would discourage participation.

The SC has to approve that the methods are reasonable and were carried out reasonably. They are the content reviewer, which largely frees DQA from that role.

2. The Role of Quality Assurance in SWB

SWB has numerous procedures and processes that need minding! The Project and Client Manager (PCM) has to fill out a form at several points. So does the statistical consultant (SC). We need a Statement of Work before the project begins, that all the key players sign off on. Many projects have to get IRB approval before they can begin.

DQA has to monitor all of this! Were the forms all signed at appropriate points? Was the SOW OK, clear, complete? Did the client agree to it? Was it followed? Did the statistical consultant approve the work done? Etc.

At times I’m surprised this hasn’t all collapsed under its own weight. There are multiple layers of oversight and record keeping, all being done by unpaid volunteers!

In the early years there was little QA in SWB. We were small, informal, and had only a few jobs. We were also lucky – we could have had a very unhappy client! We recognized that we needed to do better and to have a quality assurance plan in place.

QA (which became DQA) has been developing for many years in SWB. We now have a workable structure with a chair and vice chair, as well as a committee of about 50 volunteers. Most calls for a DQA analyst are answered quickly.

One thing we realized early is that we needed to firmly abandon standard QA practices from industry. We are not doing QA in the usual business sense. We don’t have hundreds of copies of each product to ensure no more than 2% have errors! We needed a process to oversee the projects at a high level.

The complex processes actually make each job clearer and simpler. Before we had a technical expert (SC) on the team, DQA sometimes had to monitor the quality of the work. One team I was doing DQA for made mistakes that an SC would have picked up.

For example, I noticed standard errors for dichotomies that were far too small compared to other variables. The team discovered some error and fixed it -- I didn't learn exactly what it was. And the weighting doubled one gender! I asked -- somehow gender (coded 1 and 2) had been included in the sampling weights!

Today such issues would simply be mentioned to the PCM. DQA analysts don’t generally talk to the team or even to the SC. We work with the Project and Client manager. “Can you ask the SC to take another look at the weighted analysis? Is it ok that there are now twice as many females as males?” If that person says, “Yes”, I’m done. Hopefully the SC catches such things long before DQA does!

It's helpful to have multiple eyes on the project. For example, data cleaning should be in the statement of work. Who is going to do it? It should be documented somewhere. The DQA may notice anomalies and bring them up.

But most DQA work is procedural and clarification. So and so didn't finalize the form, sign off on approval, and so on. The statement of work says 3 weeks in the first part and 6 weeks in the second part -- which is right? We fall largely under the heading of "delivery audit" versus expert review (the latter done by the SC -- we're just making sure they did and documented that review).

3. Examples of Issues from Experience

Let me share some examples of the kinds of things a DQA review can encounter. First some that I encountered when doing DQA. One statement of work said, "Identify and evaluate other data sources not named in the previous project as appropriate." This seemed very open-ended to me, so I asked them to appropriately limit it.

An SOW said that syntax will be provided for "the recommended solutions", to which I responded, "I don't know what this means. There are no 'solutions' indicated and the SWB team is going to complete data cleanup. What will the syntax do?" As I recall, the answer was that the client wanted to automate data cleaning.

This same project made clear there was no hypothesis testing, but they were going to "compare the data to existing similar sources". I asked what that meant *sans* testing?

That same SOW talked about "long-term outcomes", but they didn't appear to have long-term follow-up, so that was unclear. They said they were going to "identify trends in management" but they didn't appear to have a systematic sample over time -- unclear.

A different project was using some special software like Tableau. A question there was how the results would be provided to the client. Would they learn Tableau? Would outputs be transferred to Word? The format should be spelled out.

This one also left me unclear if there was just data visualization (in Tableau) or inferential stats. Sounded like both, so I asked.

Another DQA analyst noted "scope creep" in the spreadsheet - an additional app was developed, not in the plan. We try to avoid informal extensions of what was agreed to in the statement of work. The team has been assured that the SOW is what they would be doing, so we have to be careful allowing the project scope to "creep" into new areas.

Commonly projects fall behind timeline. This *could* be a big deal for the same reason.

In one case, the data description was noted to be vague -- but unavoidably since the data wasn't yet known.

In one case, we were lacking documentation of the code. Upon further checking it was determined that the SC provided point and click software instead of "code".

4. Forms and Documents

It may be of interest to readers to see snippets from some of the forms we have developed,

Figures 1 and 2 illustrate two pages from the "DQA submission form" that the PCM fills out. The first part (Figure 1) shows general background and identifies the team. Figure 2 shows examples of the more specific things we ask the PCM to verify. This form is a key document for the DQA analyst. That individual is not, for the most part, questioning what is in the DQA Submission form, but is rather making certain that all the proper boxes are checked and that everything has been appropriately approved.

Statistics without Borders Project DQA Submission Form	
To be completed by Project and Client Manager	
Date Updated (yyyy-mm-dd):	
Project Number:	Client:
Project Title:	
Final (End-of-Project) Submission (Yes/No)?:	
Does the deliverable include training (Yes/No)?:	
Do the primary deliverables include code (Yes/No)?:	
Project Team Members:	
Name	Role (include specific responsibility if applicable)
	Project and Client Manager
	Statistical Consultant
	Team Member
	Team Member

Figure 1: Top Part of the Delivery and Quality Assurance Submission Form, to be Completed by the Project and Client Manager.

DQA Plan	
Milestone	Exp. Date (yyyy-mm-dd)
SOW	
Project Kickoff	
Intermediate Checkpoint (repeat as needed)	
Final Checkpoint	

Has the Statistical Consultant reviewed the DQA plan above and the DQA Checklist to ensure that the expectations are aligned (Yes/No)?:

Project Kick-Off Items

All projects:

Expected outputs have been confirmed with the client (Yes/No)?:

Delivery format has been confirmed with the client (Yes/No)?:

The processes to be followed have been confirmed with the client (Yes/No)?:

The milestones and project plan have been confirmed with the client (Yes/No)?:

The Project & Client Manager Lead has been informed of the project start (Yes/No)?:

Figure 2: Another Section of the Delivery and Quality Assurance Submission Form, to be Completed by the Project and Client Manager.

Figures 3 and 4 are screen shots from the form to be submitted by the Statistical Consultant (SC). Again, notice especially in Figure 4 that SCs are asked to confirm that they have reviewed the various technical aspects and approve of them. This relieves the DQA analyst of doing that -- the analyst's job becomes checking that the SC has agreed to the necessary items to make the project a success.

In yet another section (not shown) the SC is asked after the work is done to verify that it was done correctly -- an important conclusion!

Statistics without Borders

Statistical Consultant Peer Review

Project Number: Click or tap here to enter text.	Client: Click or tap here to enter text.
Project Title: Click or tap here to enter text.	
Statistical Consultant (SC): Click or tap here to enter text.	
Project & Client Manager (PCM): Click or tap here to enter text.	

Instructions:

- Statistical Consultant (SC) fills out this form and keeps it updated in the Project DQA (Delivery and Quality Assurance) Folder throughout the project.
- See the DQA Plan in the DQA Submission Form for the checkpoints.
- Keep in mind that SC is accountable to the Project & Client Manager (PCM).
 - Collaboration with the PCM is critical for the successful completion of the project.
 - Escalate any risks and issues during the project to the PCM. If this does not resolve, escalate to the SC lead.

Figure 3: The top Section of the Statistical Consultant Peer Review Form, to be Completed by the Statistical Consultant.

SOW Checkpoint (Date Completed: Click or tap to enter a date.):

Check if any of the following:

Deliverables include training/training plan

Primary deliverables include code

High-risk project

To the best of my knowledge, no disclaimers or out-of-scope items are missing from the SOW.

To the best of my knowledge, all known risks have been identified in the SOW.

Check one of the following:

This project involves neither human subjects nor identifiable personal information. An IRB review (or equivalent) does not apply.

This project involves human subjects and/or identifiable personal information, and (select one):

An IRB (or equivalent) review has been addressed with the client.

An IRB review (or equivalent) is not needed. Explain: Click or tap here to enter text.

I sign off on the technical/statistical approach/plan in the SOW.

(If training delivered) I agree that the training proposed in the SOW is reasonable (at a high level).

Figure 4: Another Section of the Statistical Consultant Peer Review Form, to be Completed by the Statistical Consultant.

Finally, there is the spreadsheet to be completed by the DQA analyst. Figures 5 and 6 show screen shots from that form. Many lines are specific to only some situations. For example, if there is no travel involved, all of the lines asking about whether travel has been documented and approved become "N/A". There are columns to the right for the analyst to indicate yes, no or N/A. Plus columns with comments and for the analyst to add comments. There are about 80 lines in all. The column "EM v 1.1" refers to our

Engagement Manual sections. DQA, PCM, and SC are all part of the “Engagement” group of SWB.

Phase	Item (NB: PCM formerly known as BC; SC formerly known as FC)	EM v1.01	Condition
Inception	Have the SCs been allocated? If not required, is the reason sufficiently documented?	2.01	All projects
Inception	Has the SC reviewed the DQA checklist, the DQA plan, and the SC Checklist?	2.03	All projects
SOW	Is the goal of the project non-political and non-religious?	2.07	All projects
SOW	Does the SOW contain any disclaimers/out-of-scope items?	2.07	All projects
SOW	Is the scope as stated in the SOW clear, reasonable, and appropriate to the nature of the project?	2.07	All projects
SOW	Are there any disclaimers/out-of-scope items missing from the SOW?	2.07	All projects
SOW	Does the SOW contain data description?	2.07	Data analysis
SOW	Does the SOW contain expected data metrics (sample size, record counts, field counts, number of tables, etc.) appropriate for the data and the analysis, along with their justifications?	2.07	Data analysis
SOW	Does the SOW explain techniques and their justifications?	2.07	All projects
SOW	Does the SOW explain the general methodology or approach?	2.07	All projects
SOW	Does the SOW explain the statistical approach?	2.07	All projects
SOW	Has the SC signed off on the statistical/technical approach/plan in the SOW?	2.07	All projects

Figure 5: Top Section of the Delivery and Quality Assurance (DQA) Form, to be Completed by the DQA analyst.

Phase	Item (NB: PCM formerly known as BC; SC formerly known as FC)	EM v1.01	Condition
Execution	Has the PCM chair been notified of the project start?	3.01	All projects
Execution	Has the team reviewed the DQA checklist and plan to understand DQA expectations?	3.01	All projects
Execution	If NDA and/or data security agreement required, have they been signed by all relevant parties prior to project start?	3.01	NDA/data security agreement needed
Execution	Has the team been provided with the travel briefing notes?	3.01	Travel involved
Execution	Has the team been provided with the briefing notes?	3.01	Government client
Execution	Have expected outputs been confirmed with client?	3.02	All projects
Execution	Has delivery format been confirmed with client?	3.02	All projects
Execution	Have the processes to be followed been confirmed with client?	3.02	All projects
Execution	Have milestones and project plan been confirmed with client?	3.02	All projects
Execution	Has data to be used been confirmed with client?	3.02	Data analysis
Execution	If an IRB review is required, has approval been attained before the project starts?	3.02	IRB review needed
Execution	Has the team attended a travel briefing with the Engagement Director and the client before travel?	Before 3.03	Travel involved
Execution	Has travel funding, tickets, and documentation (visa, etc.) been arranged?	Before 3.03	Travel involved
Execution	Have travel logistics been documented?	Before 3.03	Travel involved

Figure 6: A Later Section of the Delivery and Quality Assurance (DQA) Form, to be Completed by the DQA analyst.

5. Final Thoughts and Lessons Learned

And then there is monitoring of DQA! One of us needs to periodically check in with our analysts. “Why is the SOW form not in the project folder?” “The SC form is blank although the project is underway. Does the SC know it needs to be completed?” “There is **nothing** in the DQA folder. Did you get access to it?” And so on.

There are a number of lessons I might cite.

- Even a pro-bono statistical organization needs a business model including an SOW.
- We need a careful structure, with documents, forms, and guidelines.
- All of this protects us and our clients.
- We need DQA to keep an eye on the projects.
- Somebody needs to periodically check in with the DQA analysts as well!

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